

Response Under 37 C.F.R. §1.192
Appellant's Brief

07-28-05

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Application No. 09/831,001
Paper dated: July 27, 2005
Attorney Docket No. 702-010717



**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

In re: Patent Application of
Cindy T.C. Cuypers et al.

: PATENT APPLICATION

Serial No.: 09/831,001

: Group Art Unit: 1723

Filed: September 19, 2001

: Examiner: Krishnan S. Menon

For: Device for Treating a Gas/Liquid
Mixture

: Atty. Docket No.: 702-010717

MAIL STOP APPEAL BRIEF – PATENTS

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

**ON APPEAL FROM THE PRIMARY EXAMINER TO THE
BOARD OF PATENT APPEALS AND INTERFERENCES**

APPELLANT'S BRIEF UNDER 37 C.F.R. § 1.192

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REAL PARTY IN INTEREST

The real party in interest in this Appeal is SPARK Technologies and Innovations N.V. and Koch-Glitsch N.V., having a principal place of business at Kaya W.F.G. (Jombi) Mensing 36, Curacao, the Netherlands Antilles and Scharlooweg 81, Curacao, the Netherlands Antilles, respectively.

II

RELATED APPEALS AND INTERFERENCES

As the legal representative of Appellant, the undersigned attorney has no knowledge of any appeals or interferences directly related to this Appeal.

III

STATUS OF CLAIMS

This is a national stage application of International Application No. PCT/NL/00677 in which claims 13-24 and 27-34 remain pending in this application.

Claims 13-21 and 27-34 (pending) were finally rejected under 35 U.S.C. §103(a) as obvious over International Publication Number WO 97/49477 ("WO 97/49477") in view of U.S. Patent No. 4,187,089 ("Hodgson") in an Office Action mailed December, 27, 2005 ("Final Office Action").

Claims 22-24 (pending) were finally rejected under 35 U.S.C. §103(a) as obvious over International Publication Number WO 97/49477 ("WO 97/49477") in view of U.S. Patent No. 4,187,089 ("Hodgson") and further in view of International Publication Number 93/05339 ("WO 93/05339") in an Office Action mailed December, 27, 2005 ("Final Office Action").

Twenty (20) claims (13-24 and 27-34) are at issue in this Appeal.

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IV

STATUS OF AMENDMENTS

No claims were amended after final rejection. A copy of the claims involved in this Appeal is contained in the Appendix attached hereto.

V

SUMMARY OF CLAIMED SUBJECT MATTER

Several embodiments of Applicants' invention are set forth in independent claims 13, 20, 22, and 27 of this application. Each of these claims is directed to an improved device for treating a gas/liquid mixture, also referred to commonly in the art as a separating "cyclone". Such cyclones may be provided in two different forms or embodiments. In the first embodiment, the cyclone includes a main conduit with a swirl body positioned therein for setting a gas/liquid flow mixture into rotation in the main conduit. The centrifugal force acting on the gas/liquid mixture causes separation between the liquid component and the gas component of the flow. An improvement to the "standard" cyclone just described utilizes a feedback or recycle conduit in the main conduit. In such recycle cyclones, a portion of the gas/liquid mixture is discharged laterally through openings in the main conduit wall. A part of the gas/liquid mixture discharged through the openings is discharged directly, while another part of the gas/liquid mixture is discharged through the openings is recycled via the feedback/recycle conduit and reintroduced. The recycle flow is reintroduced into the flow in the main conduit via the feedback/recycle conduit. Such recycle cyclones provide improved separating efficiency than standard cyclones.

A significant problem in the field of separating cyclones, whether standard or recycle cyclones, is liquid creep. Liquid creep relates to liquid flow along the outer surface of the swirl body which enters the outgoing axial flow from the main conduit during operation of the cyclone. The liquid creep flow moves or "creeps" along the outer surface of the swirl body and causes unwanted liquid to enter the outgoing axial flow from the main conduit of the cyclone.

In one embodiment set forth in independent claim 13, Applicants have invented a device for treating a gas/liquid mixture that addresses the foregoing liquid creep problem. The device comprises a substantially vertical

tube having an inlet opening for the mixture and an outlet opening for the mixture located downstream. A rotating means is arranged in the tube for setting the mixture into rotating movement. One or more outlet openings are arranged downstream relative to the rotating means for allowing a separated part of the mixture to flow laterally out of the tube. A return/recycle conduit is arranged centrally in an axial direction through the rotating means for reintroducing the flow which has exited via the outlet openings. A divergence element is provided at an end part of the return conduit for causing the reintroduced flow to diverge substantially laterally outward from the return conduit and substantially prevents liquid creep flow along the rotating means. An axial obstruction is provided in the reintroduced flow path for inducing the reintroduced flow in the divergence element to diverge substantially laterally outward from the divergence element. Lastly, independent claim 13 recites that the flow path of the mixture comprises moving up the tube, out the one or more outlet openings, and reintroducing the flow through the return conduit with the flow diverging substantially laterally outward from the return conduit. (See independent claim 13 as amended in by Applicants' November 3, 2004 Amendment ("Amendment").

In another embodiment set forth in independent Claim 20, Applicants have discovered an installation for separating water from gas including the foregoing device for treating a gas/liquid mixture. The installation comprises a vessel provided with a connecting stub for supply of the mixture, a drain conduit for draining liquid collected in the bottom of the vessel, and one or more boxes in which one or more of the devices for treating a gas/liquid mixture are arranged. (See independent claim 20 as amended in the Amendment).

In another embodiment set forth in independent Claim 22, Applicants have invented a device for treating a gas/liquid mixture, comprising a substantially vertical tube having an inlet opening for the mixture and an outlet opening for the mixture is located downstream. A rotating means is arranged in the tube for setting the mixture into rotating movement. A substantially

conical tapering outlet for the mixture located downstream. One or more slots are arranged to allow a part of the mixture to flow laterally out of the outlet. A return/recycle conduit is arranged centrally in an axial direction through the rotating means for reintroducing the flow which has exited via the one or more slots. A divergence element is provided at an end part of the return conduit for causing the reintroduced flow to diverge substantially laterally outward from the return conduit and substantially prevents liquid creep flow along the rotating means. An axial obstruction is provided in the reintroduced flow path for inducing the reintroduced flow in the divergence element to diverge substantially laterally outward from the divergence element. (See independent claim 22 in the Amendment).

In further embodiment set forth in independent Claim 27, Applicants have invented a device for treating a gas/liquid mixture, comprising a substantially vertical tube having an inlet opening for the mixture and an outlet opening for the mixture located downstream. A swirl element is arranged in the tube for setting the mixture into rotating movement. One or more outlet openings are arranged downstream relative to the swirl element for allowing a separated part of the mixture to flow laterally out of the tube. A return/recycle conduit is arranged centrally in an axial direction through the rotating means for reintroducing the flow which has exited via the outlet openings. A divergence element is provided at an end part of the return conduit for causing the reintroduced flow to diverge substantially laterally outward from the return conduit and substantially prevents liquid creep flow along the swirl element. An axial obstruction is provided in the reintroduced flow path for inducing the reintroduced flow in the divergence element to diverge substantially laterally outward from the divergence element. (See independent claim 27 in the Amendment).

VI

GROUNDS OF REJECTIONS TO BE REVIEWED ON APPEAL

- I. Has a Prima Facie Case of Obviousness Under 35 U.S.C. § 103(a) of Claims 13-21 and 27-34 as obvious over International Publication Number WO 97/49477 ("WO 97/49477") in view of U.S. Patent No. 4,187,089 ("Hodgson") Been Established?
- II. Has a Prima Facie Case of Obviousness Under 35 U.S.C. § 103(a) of Claims 22-24 as obvious over International Publication Number WO 97/49477 ("WO 97/49477") in view of U.S. Patent No. 4,187,089 ("Hodgson") and further in view of International Publication Number 93/05339 ("WO 93/05339") Been Established?

VII

ARGUMENT

- I. The Required Prima Facie Case of Obviousness Under 35 U.S.C. § 103(a) of Claims 13-21 and 27-34 as obvious over International Publication Number WO 97/49477 ("WO 97/49477") in view of U.S. Patent No. 4,187,089 ("Hodgson").
- II. The required Prima Facie Case of Obviousness Under 35 U.S.C. § 103(a) of Claims 22-24 as obvious over International Publication Number WO 97/49477 ("WO 97/49477") in view of U.S. Patent No. 4,187,089 ("Hodgson") and further in view of International Publication Number 93/05339 ("WO 93/05339") Has Failed to be Established.

A. The Rejections

Claims 13-21 and 27-34 have been rejected under 35 U.S.C. § 103(a) as obvious over International Publication Number WO 97/49477 ("WO 97/49477") in view of U.S. Patent No. 4,187,089 ("Hodgson").

Claims 22-24 have been rejected under 35 U.S.C. § 103(a) as obvious over International Publication Number WO 97/49477 ("WO 97/49477") in view of U.S. Patent No. 4,187,089 ("Hodgson") and further in view of International Publication Number 93/05339 ("WO 93/05339").

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The reasons for the rejections are set forth in the Final Office Action of December 27, 2005 ("Final Office Action"), and are summarized as follows:

In Paragraph 1 of the Final Office Action, independent claim 13 was addressed. In particular, it was argued stated that WO 97/49477 discloses a device for treating a gas/liquid mixture comprising a tube (1) with inlet (A) and outlet (B), rotating means (5), outlet openings downstream of the rotating means for lateral flow of the liquid drops (9), an axial return conduit (12) centrally located through the rotating means (5) and divergence element (7) in the return conduit, and that the flow path of the WO 97/49477 device follows that indicated in independent claim 13. Webster's Collegiate Dictionary, 10th Edition was cited with respect to the meaning of the phrase "substantially laterally" present in paragraph "(e)" of the claim, and stated that the word "substantially" is defined as "considerable in quantity". From this Webster's definition, it was concluded that a "considerable quantity of flow could diverge from the axial direction of nozzle 7 of WO'477", (Page 2, lines 7-15 of the Final Office Action). Page 3, lines 29-36 and page 4, lines 5-8 of WO 97/49477 were cited specifically in the Final Office Action in connection with the "substantially laterally" language set forth in independent claim 13, (Page 2, line 16 to page 3, line 3 of the Final Office Action).

Next in the Final Office Action, Hodgson was cited for a teaching providing an axial obstruction in a return flow line, stating that "Hodgson teaches an axial flow obstruction (44) in a flow line that carries liquid drops in a gas stream". It was concluded based on this teaching that "it would have been obvious to one of ordinary skill in the art at the time of invention to use the teaching of Hodgson in the teaching of WO'477 to have the axial conical obstruction to have the gases impinge the obstruction so as to coalesce the liquid droplets in the gas stream, thereby effectively removing the final traces of liquid from the gas stream, as taught by Hodgson", (Page 3, lines 4-11 of the Final Office Action).

It is further alleged in the Final Office Action at page 3, lines 12-18 that Applicants' last amendment of claim 13, which stated in pertinent part that the

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divergence element "substantially prevent liquid creep flow along the rotating means" implicates the Sixth Paragraph of 35 U.S.C. §112 as being the "function" limitation of a means-plus-function limitation. It was then concluded that "the WO'477 as modified by Hodgson would inherently have this effect, even though Hodgson does not teach this aspect", (Page 3, line 17 of the Final Office Action).

The subject matter set forth in dependent claims 14-19, which depend from independent claim 13, was then addressed at page 3, line 19 to page 4, line 9 of the Final Office Action. In particular, element "46" in Hodgson (FIG. 1) was cited in connection with claims 14 and 15 and FIG. 1 of WO 97/49477 was cited in connection with claims 16-18. It was further concluded with respect to the subject matter of claim 19 that the claimed size of the separated droplets would be obvious to one skilled in the art based on the alleged similar structure of WO 97/49477 combined with Hodgson, (Page 4, lines 5-9 of the Final Office Action).

With respect to independent claim 20, at page 4, lines 10-18 of the Final Office Action it is alleged that WO 97/49477 discloses an installation having a vessel with a supply connections stub, one or more boxes in which one or more devices for treating a gas/liquid mixture is arranged, but not a liquid drain conduit from the bottom of the vessel as set forth in independent claim 20. Hodgson was then cited as teaching a liquid drain from the bottom of a vessel, (Page 4, line 15 of the Final Office Action).

With respect to independent claim 27, the foregoing discussion relating to independent claim 13 was cited in the Final Office Action at page 4, lines 19-20 of the Final Office Action.

Dependent claims 28-32 were rejected for similar reasons as those discussed previously for claims 14-18 at page 4, lines 21-22 of the Final Office Action.

The figures of Hodgson were cited in the Final Office Action for the "conical element" claimed in claims 33 and 34, (Page 5, lines 1 and 2 of the Final Office Action).

In Paragraph 2 of the Final Office Action, specific and separate rejections were made against claims 22-24, (Page 5, Paragraph 2 of the Final Office Action). In particular, claims 22-24 were rejected under 35 U.S.C. § 103(a) as obvious over International Publication Number WO 97/49477 ("WO 97/49477") in view of U.S. Patent No. 4,187,089 ("Hodgson") and further in view of International Publication Number 93/05339 ("WO 93/05339"). With respect to independent claim 22, the foregoing discussion relating to claim 13 was referenced and it was indicated that WO 97/49477 in view of Hodgson does not disclose a conical outlet with the claimed limitations or an additional tube part as set forth in dependent claim 24, (Page 5, lines 9-11 of the Final Office Action). WO 93/05339 was cited to overcome this deficiency in the cited combination. It is alleged in Paragraph 2, lines 11-12 of the Final Office Action that that "WO 93/05339 teaches a conical outlet (3, FIG. 1) and an additional tube part (9-fig 1) in the outlet of a similar liquid-gas mixture separation device". From this it is concluded that it would be obvious to use the teachings of WO 93/05339 in the previously cited combination "to make the outlet end conical with the additional tube part because it would decrease the carry over of the liquid droplets in the gas stream as taught by WO 93/05339 (lines 20-37, page 10)", (Page 5, lines 13-17 of the Final Office Action).

In the final section of the Final Office Action entitled "Response to Arguments", Applicants' argument relating to hindsight reconstruction was deemed unpersuasive because WO 97/49477 teaches a vertical unit and Hodgson was used to show an axial obstruction and radial flow in the return conduit and allegedly provides motivation for this construction, (Page 6, lines 10-11 of the Final Office Action). In response to Applicants' argument that the proposed modification of Hodgson from horizontal to vertical would impair the intended operation of the Hodgson device, it was stated that "it is the WO'477 ref that is being modified and there is no question of the Hodgson ref being destroyed" and "such a modification would not make the structure inoperable", (Page 6, lines 15-17 of the Final Office Action). Further, in response to

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Applicants' argument relating to lack of motivation to combine the cited references, it was alleged that this argument was addressed in previous Office Actions, (Page 6, lines 20-21 of the Final Office Action). Finally, with respect to Applicants' argument regarding Hodgson not teaching a return conduit, it was stated that "this is not relevant because Hodgson is used for axial-obstruction, radial flow pipe in the vapor-liquid separator", (Page 7, lines 1-3 of the Final Office Action).

B. The Prior Art

WO 97/49477 discloses a device for treating a gas/liquid mixture. The device is vertically-oriented and includes an inlet (A) for in-feed of the mixture, a flow element (4), an outlet (8), and one or more feedback lines (B, D), (Abstract and Page 3, lines 17-23 of WO 97/49477). Flow element (4) is located in a cylindrical body (2) defining inlet (A), and includes one or more blades (5) for causing turbulence in the mixture, (Page 3, lines 18-19 of WO 97/49477). Outlet (8) is located downstream of flow element (4) for out-flow of gas flow, (Page 3, line 22 of WO 97/49477). Additionally, the one or more feedback lines (B, D) are connected to a recycle channel or conduit (12) arranged centrally in flow element (4) for discharge as a separated liquid into a part of the gas flow, (Abstract and Page 3, lines 36-38 of WO 97/49477). An anti-creep flow interrupter (7) is provided on flow element (4) at the end of channel (12), (Page 3, lines 20-21 of WO 97/49477).

Hodgson discloses a horizontally-oriented separator (10) that includes inlet tubing (18), a pipe (24) coaxially aligned with the inlet tubing (18), and a pair of pipes (36, 38) coaxially aligned with the pipe (24), (Column 2, lines 24-25 and 43-44 of Hodgson). A baffle (44) is coaxially aligned with pipe (38) and spaced from pipe (38) by axially-extending circumferentially spaced rib members (46), (Column 2, lines 51-59 of Hodgson). The cone apex of baffle (44) is directed toward the end of pipe (38), (Column 2, lines 51-59 of Hodgson). In operation, baffle (44) is used to reverse the forward flow of the vapor/liquid mixture in pipes (24, 36, 38) and the liquid droplets impinging on baffle (44) are coalesced and fall to the bottom of chamber (14), (Column 3, lines 28-33 of Hodgson). Once the flow stream is substantially free of liquid, gas exits chamber (14) through exhaust tubing (48), (Column 3, lines 30-32 of Hodgson). Liquid in chamber (14) drains by gravity flow into the liquid accumulation chamber (56), (Column 3, lines 32-33 of Hodgson).

WO 93/05339 discloses a steam separator that utilizes blades (12) to rotate a mixture of steam and water causing the water to form a film on the

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inside of a tube (1), (Page 6, lines 3-6 of WO 93/05339). A plurality of perforations (8) is located on the tube wall to allow the water to escape, (Page 6, lines 9-11 of WO 93/05339). The main tube includes a cylindrical section (2), which merges at the top into a tapering or conical tube section (3), (Page 5, lines 20-22 of WO 93/05339). Additionally, an outlet tube (9) is mounted at the upper narrow end of conical tube section (3), (Page 5, lines 31-34 of WO 93/05339).

C. The Required Prima Facie Cases of Obviousness Under 35 U.S.C. § 103(a) Has Not Been Established

When making a rejection under 35 U.S.C. § 103, the Examiner has the burden of establishing a prima facie case of obviousness. In re Fritch, 23 U.S.P.Q.2d 1780, 1783 (Fed. Cir. 1992).

The Examiner can satisfy this burden only by showing an objective teaching in the prior art, or knowledge generally available to one of ordinary skill in the art, which would lead an individual to combine the relevant teachings of the references [and/or the knowledge] in the manner suggested by the Examiner. Id.; In re Fine, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988).

The mere fact that the prior art could be modified does not make the modification obvious *unless the prior art suggests the desirability of the modification* (emphasis added). In re Fritch, 23 U.S.P.Q.2d at 1784; In re Laskowski, 10 U.S.P.Q.2d 1397, 1398 (Fed. Cir. 1989); In re Gordon, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984).

"The ultimate determination of patentability must be based on consideration of the entire record, by a preponderance of evidence, with due consideration to the persuasiveness of any arguments and any secondary evidence." Manual of Patent Examining Procedure, (Rev. 1, Feb. 2003) § 716.01(d) and In re Oetiker, 24 U.S.P.Q.2d 1443, 1444 (Fed. Cir. 1992).

I. Obviousness Rejection of Claims 13-21 and 27-34 over International Publication Number WO 97/49477 ("WO 97/49477") in view of U.S. Patent No. 4,187,089 ("Hodgson")

Rejection of Independent Claims 13, 20, 22, and 27

As discussed previously, a significant problem in the field of separating cyclones, whether standard or recycle cyclones, is liquid creep. Liquid creep relates to liquid flow along the outer surface of the swirl body which enters the outgoing axial flow from the main conduit during operation of the cyclone. The liquid creep flow moves or "creeps" along the outer surface of the swirl body and causes unwanted liquid to enter the outgoing axial flow from the main conduit of the cyclone.

WO 97/49477 attempts to address the problem of liquid creep flow in a recycle cyclone. WO 97/49477 addresses the liquid creep flow problem by providing an open liquid creep flow interrupter (7) at the end of flow element (4), (Page 3, lines 20-21 of WO 97/49477). The stated function of liquid creep flow interrupter (7) is to deflect the liquid flow (i.e., creep flow) along the outside of flow element (4) outward, (Page 4, lines 14-20 of WO 97/49477). Thus, the explicit stated purpose of creep flow interrupter (7) is to physically deflect the liquid creep flow along flow element (4) outward into flow space (3) with a deflecting element, (Page 4, lines 14-20 of WO 97/49477). Liquid creep flow interrupter (7) in no way affects the recycle flow passing through flow element (4) via conduit (12), in that recycle flow passes vertically through the unobstructed top opening in flow element (4).

In operation, the recycle cyclone of WO 97/49477 has a portion of the main gas/liquid flow (i.e., primarily liquid) exiting flow space (3) via openings (9) and reenter the main gas/liquid flow through recycle conduit (12), (Page 3, lines 24-38 of WO 97/49477). This recycle flow exiting conduit (12) exits this conduit axially in exactly the same manner as a "standard" recycle cyclone, discussed previously. The recycle flow reentering the main flow inevitably will include a significant percentage of liquid. This liquid will, as a result, ultimately and undesirably exit the device via opening (8). The liquid creep flow interrupter (7) will have no effect on the axially discharging recycle flow

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existing conduit (12), and therefore will have no effect on the liquid in this flow. In contrast, the claimed device has substantially laterally divergent flow exiting slots (19) which "blows off" liquid creep flow on swirl element (13), (Page 5, lines 5-10 of the present Application ("Application"). Additionally, due to the presence of the divergence element and axial obstruction inducing or causing this substantially lateral flow, the claimed device, in operation, virtually eliminates the liquid portion of the axially discharging recycle flow found in the recycle cyclone of WO 97/49477. This is because the substantially laterally divergent flow exiting slots (19) in the present device will direct the liquid portion of the axial recycle flow in conduit (16) outward to outlet openings (12) to be recycled again, (Page 4, lines 3-8 of the Application). With each pass through the recycle conduit (16), the liquid portion of the recycle flow is further reduced. WO 97/49477 and, for that matter, Hodgson does not in any way teach or suggest this concept as embodied in the language of the independent claims.

In view of the foregoing, Applicants respectfully submit that each of the pending independent claims distinguish over the cited combination of references. While WO 97/49477 discloses a liquid creep flow interrupter (7) and flow element (4), liquid creep flow interrupter (7) has absolutely no effect on the recycle or reintroduce flow within flow element (4), which passes directly vertically therethrough. As indicated previously, the stated function of the liquid creep flow interrupter (7) is to physically deflect the liquid creep flow on the outer surface of flow element (4) outward into flow space (3), (Page 4, lines 14-20 of WO 97/49477). Thus, the liquid creep flow interrupter (7) is not a "divergence element at an end part of the return conduit for causing the reintroduced (recycle) flow to divert substantially laterally outward to the return conduit", as required by each of the pending independent claims. More importantly, as indicated, the liquid creep flow interrupter (7) has no effect on the axial flow discharging from the end of the flow element (4). Accordingly, WO 97/49477 lacks any teaching or suggestion that the recycle flow exiting the flow element (4) has a radial or lateral component induced or caused by

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the liquid creep flow interrupter (7) as set forth in the pending independent claims. Further, WO 97/49477 fails to teach or suggest the "axial obstruction" set forth in the pending independent claims, (Page 3, line 4 of the Final Office Action).

Hodgson was cited to overcome the foregoing shortcoming with WO 97/49477 relating to the "axial obstruction" language in the independent claims, and baffle structure (44, 46) disclosed in Hodgson was specifically cited to overcome this deficiency, (Page 3, lines 4-7 of the Final Office Action). Applicants respectfully submit that the Hodgson does not overcome this or the other deficiencies of WO 97/49477 discussed previously for the following reasons.

First, it is noted that Hodgson is directed to a horizontal vapor-liquid separator and includes a horizontal baffle structure (44, 46) for the express purpose of reversing fluid flow in horizontal pipe (24) and allow any liquid droplets impinging on baffle (44) to coalesce and fall to the bottom of chamber (14) under the force of gravity, (Column 2, lines 28-30 of Hodgson). In contrast, the pending independent claims are directed to a "recycle cyclone" device for treating a gas/liquid mixture with a "substantially vertical" main tube or conduit as shown in FIG. 2 of the Application. The suggestion made is to take horizontal baffle structure (44, 46), turn this structure 90°, and apply it to flow element (4) in the vertical recycle cyclone device disclosed in WO 97/49477 without any teaching or suggestion to do so in either reference. The only motivation for such a radical alteration of horizontal baffle structure (44, 46) and subsequent "addition" to flow element (4) is found in Applicants' disclosure. Accordingly, it is submitted that Applicants' disclosure was used as a blueprint or roadmap in an attempt to recreate the claimed invention, and this amounts to impermissible hindsight reconstruction. Clearly, a specific structure from Hodgson, namely horizontal baffle structure (44, 46), was arbitrarily selected and this structure was altered to extend vertically such that it will no longer perform its intended (and specifically stated) function. This structure was then applied or added to flow element (4) in the recycle cyclone

disclosed in WO 97/49477 without a teaching or suggestion in either reference directing one skilled in the art to make such an alteration and/or "addition". As a reminder, the stated purpose in the Hodgson patent for baffle structure (44, 46) is to reverse the horizontal flow in pipe (24) and allow the liquid droplets impinging on baffle (44) to coalesce and drip to the bottom of chamber (14) under the force of gravity, (Column 3, lines 28-36 of Hodgson).

Next, one skilled in the art would not have been motivated to make such an "addition" based on the general knowledge and skill of one skilled in the art. In particular, taking into consideration the stated purpose of horizontal baffle structure (44, 46) which is to reverse the flow in horizontal pipe (24), coalesce or collect liquid from the flow, and allow the liquid to drain away under the force of gravity, one skilled in the art would not likely ignore these specific teachings, which clearly teach away from using horizontal baffle structure (44, 46) in a vertical orientation, (Column 3, lines 28-26 of Hodgson). Horizontal baffle structure (44, 46) is adapted to physically block the horizontal flow in pipe (24) so that gravity may act on the liquid portion of the flow to remove this portion from the flow. The suggested alteration of horizontal baffle structure (44, 46) to extend vertically in the Final Office Action is contrary to the explicit teachings in Hodgson relating to horizontal baffle structure (44, 46). Moreover, the suggested "vertical" alteration of horizontal baffle structure (44, 46) would completely destroy or at the very least severely impair the primary and explicitly stated purpose of baffle structure (44, 46), which is to collect horizontally-flowing liquid and allow the liquid to drain away under the force of gravity, (Column 3, lines 28-36 of Hodgson). A suggested alteration of a structure cannot render the structure inoperable for its stated purpose, (MPEP § 2145, Section X, Paragraph D). Clearly, the suggested alteration of horizontal baffle structure (44, 46) and subsequent "addition" to flow element (4) will render horizontal baffle structure (44, 46) inoperable or impaired for its intended stated purpose of collecting horizontally-flowing liquid in pipe (24) and allowing the liquid to drain away under the force of gravity. Applicants respectfully submit that this would

exactly be the result of the suggested alteration of horizontal baffle structure (44, 46), as this structure would no longer be suitable to block a horizontally flowing gas/liquid fluid mixture for the purpose of "coalescing" liquid and draining the liquid away under the force of gravity". Accordingly, the suggested "vertical" alteration of horizontal baffle structure (44, 46) not only runs contrary to the teachings in Hodgson but also destroys or at the very least severely impairs the intended purpose for this structure.

Assuming, *arguendo*, that there would have been motivation to apply horizontal baffle structure (44, 46) to the vertical recycle cyclone disclosed by WO 97/49477, the natural extension of baffle structure (44, 46) to the recycle cyclone of WO 97/49477 is to add baffle structure (44, 46) to outlet (8) downstream of the flow element (4), (See FIG. 1 of WO 97/49477), rather than to flow element (4). Applicants have previously established that WO 97/49477 is devoid of a teaching relating to an axial obstruction, either in the "main" conduit or flow space (3) or in the recycle conduit (12) (See FIG. 1 of WO 97/49477). As will be apparent in reviewing FIG. 1 of Hodgson, there is no recycle or return conduit associated with the horizontal vapor/liquid separator and, therefore, no recycle or return conduit is disposed in main conduit or pipe (24). Since horizontal baffle structure (44, 46) is located at end of main conduit or pipe (24), the logical application of this structure to the vertical recycle cyclone disclosed in WO 97/49477 is at the end of outlet (8) downstream of flow element (4). To apply this structure to flow element (4) is not supported by the disclosure of the two cited references. Once again, the only place such a teaching or suggestion (i.e., to apply baffle structure (44, 46) to flow element (4)) may be found is in Applicants' disclosure and this amounts to impermissible hindsight reconstruction. Simply put, neither of the cited references includes a teaching or suggestion of associating baffle structure (44, 46) with a "recycle" conduit in a vertically-orientated cyclone device.

The device claimed in the pending independent claims is adapted to address the liquid creep flow problem discussed previously that occurs in

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vertically-oriented recycle cyclones. As shown in FIG. 2 of the Application, the divergence element and axial obstruction operate to induce or cause the recycle flow to diverge substantially laterally outward from the return conduit, (Page 4, lines 3-8 of the Application). This laterally divergent, outward flow has the effect of "blowing off" the liquid "creeping" up the body of swirl element (13), (Page 5, lines 5-10 of the Application). Thus, the "liquid creep flow interrupter" set forth in the pending independent claims is the substantially lateral outward flow from the return conduit caused by the divergence element and axial obstruction. Since WO 97/49477 already includes such a liquid creep flow "interrupter" in the form of liquid creep flow interrupter (7), there is simply no motivation to apply horizontal baffle structure (44, 46) found in Hodgson to flow element (4) of WO 97/49477. Such an addition would be redundant. Since a liquid creep flow interrupter (7) is already present in WO 97/49477 one skilled in the art would have no need or motivation to add a second such structure to the vertically oriented flow element (4) disclosed by WO 97/49477. The "addition" of the horizontal baffle structure (44, 46) is unnecessary, redundant, and is contrary to the teachings of WO 97/49477. The suggested "addition" only makes sense when viewed through the prism provided by Applicants' disclosure, which is hindsight reconstruction.

For the foregoing reasons, Applicants respectfully request that the rejection of independent claims 13, 20, 22, and 27 under U.S.C. § 103(a) be reconsidered and withdrawn.

Rejection of claims 14-19, 21, and 28-34

Generally, claims 14-19, 21, and 28-34 depend from independent claims 13, 20, and 27 and define further features of the invention. Accordingly, Applicants respectfully request that the rejection of claims 14-19, 21, and 28-34 under 35 U.S.C. § 103(a) be reconsidered and withdrawn for the reasons set forth previously in connection with independent claims 13, 20, 22, and 27.

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II. **Obviousness Rejection of Claims 22-24 over International Publication Number WO 97/49477 ("WO 97/49477") in view of U.S. Patent No. 4,187,089 ("Hodgson") and further in view of International Publication Number 93/05339 ("WO 93/05339")**

Generally, claims 22-24 have been rejected over the combination of WO 97/49477 in view of Hodgson and further in view of WO 93/05339. WO 93/05339, as indicated previously, discloses a steam separator that utilizes blades (12) to rotate a mixture of steam and water causing the water to form a film on the inside of a tube (1), (Page 6, lines 3-6 of WO 93/05339). A plurality of perforations (8) is located on the tube wall to allow the water to escape, (Page 6, lines 9-11 of WO 93/05339). The main tube includes a cylindrical section (2), which merges at the top into a tapering or conical tube section (3), (Page 5, lines 20-22 of WO 93/05339). Additionally, an outlet tube (9) is mounted at the upper narrow end of conical tube section (3), (Page 5, lines 31-34 of WO 93/05339).

The addition of the conical tube section (3) disclosed by WO 93/05339 does not overcome the foregoing deficiencies with the cited combination of WO 97/49477 in view of Hodgson. Therefore, Applicants respectfully request that the rejection of claims 22-24 under 35 U.S.C. § 103(a) be reconsidered and withdrawn for all the reasons set forth previously.

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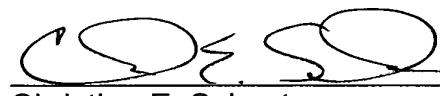
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D. Conclusion

In conclusion, Applicants respectfully assert that the *prima facie* case of obviousness has not been established with respect to pending claims 13-24 and 27-34 for all the reasons set forth hereinabove. Accordingly, Applicants respectfully request that the § 103(a) rejections of pending claims 13-24 and 27-34 be reconsidered and withdrawn.

Respectfully submitted,

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CLAIM APPENDIX

13. A device for treating a gas/liquid mixture, comprising:

a) a substantially vertical tube having an inlet opening for the mixture and an outlet for the mixture located downstream;

b) rotating means arranged in the tube for setting the mixture into rotating movement;

c) one or more outlet openings arranged downstream relative to the rotating means for allowing a separated part of the mixture to flow laterally out of the tube;

d) a return conduit arranged centrally in an axial direction through the rotating means for reintroducing the flow which has exited via the outlet openings, and including a divergence element at an end part of the return conduit for causing the reintroduced flow to diverge substantially laterally outward from the return conduit and substantially prevent liquid creep flow along the rotating means; and

e) an axial obstruction in the reintroduced flow path for inducing the reintroduced flow in the divergence element to diverge substantially laterally outward from the divergence element;

wherein a flow path of the mixture comprises moving up the tube, out the one or more outlet openings, and reintroducing the flow through the return conduit with the flow diverging substantially laterally outward from the return conduit.

14. The device as claimed in claim 13, wherein the divergence element comprises slots defined in the return conduit.

15. The device as claimed in claim 13, wherein the axial obstruction comprises a substantially conical disposed in the reintroduced flow path.

16. The device as claimed in claim 13, wherein the outlet openings are formed by a number of slots in the side wall of the tube.

17. The device as claimed in claim 13, wherein the rotating means comprise a swirl element, of which the outflow angle for the mixture amounts to 15°- 85°.

18. The device as claimed in claim 17, wherein the outflow angle amounts to about 45°, about 60° or about 70°.

19. The device as claimed in claim 13, wherein 50% of droplets in the separated part of the mixture have a diameter of 4 µm or less.

20. An installation for separating water from gas, comprising:
a) a vessel provided with a connecting stub for supply of the mixture;

b) a drain conduit for draining liquid collected in the bottom of the vessel; and

c) one or more boxes in which one or more devices for treating a gas/liquid mixture, wherein the device comprises:

a substantially vertical tube having an inlet opening for the mixture and an outlet for the mixture located downstream;

rotating means arranged in the tube for setting the mixture into rotating movement;

one or more outlet openings arranged downstream relative to the rotating means for allowing a part of the mixture to flow laterally out of the tube;

d) a return conduit arranged centrally in axial direction through the rotating means for reintroducing the flow which has exited via the outlet openings, and including a divergence element at an end part of the return conduit for causing the reintroduced flow to diverge substantially

laterally outward from the return conduit and substantially prevent liquid creep flow along the rotating means; and

e) an axial obstruction in the reintroduced flow path for inducing the reintroduced flow in the divergence element to diverge substantially laterally outward from the divergence element;

wherein a flow path of the mixture comprises moving up the tube, over the one or more outlet openings, and reintroducing the flow through the return conduit with the flow diverging substantially laterally outward from the return conduit.

21. The installation as claimed in claim 20, wherein at least one liquid conduit extends between the box and the space in the bottom of the vessel where the liquid is collected.

22. A device for treating a gas/liquid mixture according to claim 13, comprising:

a) a substantially vertical tube having an inlet opening for the mixture;

b) rotating means arranged in the tube for setting the mixture into rotating movement;

c) a substantially conically tapering outlet for the mixture located downstream, wherein one or more slots are arranged to allow a part of the mixture to flow laterally out of the outlet;

d) a return conduit arranged centrally in an axial direction through the rotating means for reintroducing the flow which has exited via the one or more slots, and including a divergence element at an end part of the return conduit for causing the reintroduced flow to diverge substantially laterally outward from the return conduit and substantially prevent liquid creep flow along the rotating means; and

e) an axial obstruction in the reintroduced flow path for inducing the reintroduced flow in the divergence element to diverge substantially laterally outward from the divergence element.

23. The device as claimed in claim 22, wherein the conicity of the tapering outlet amounts to 1° - 30°.

24. The device as claimed in claim 22, further including an additional tube part which protrudes at least partially upstream in the outlet.

27. A device for treating a gas/liquid mixture, comprising:

a) a substantially vertical tube having an inlet opening for the mixture and an outlet for the mixture located downstream;

b) a swirl element arranged in the tube for setting the mixture into rotating movement;

c) one or more outlet openings arranged downstream relative to the swirl element for allowing a separated part of the mixture to flow laterally out of the tube;

d) a return conduit arranged centrally in an axial direction through the rotating means for reintroducing the flow which has exited via the outlet openings, and including a divergence element at an end part of the return conduit causing reintroduced flow to diverge substantially laterally outward from the return conduit and substantially prevent liquid creep flow along the swirl element; and

e) an axial obstruction in the reintroduced flow path for inducing the reintroduced flow in the divergence element to diverge substantially laterally outward from the divergence element.

28. The device as claimed in claim 27, wherein the divergence element comprises slots defined in the return conduit.

29. The device as claimed in claim 27, wherein the axial obstruction comprises a substantially conical element disposed in the reintroduced flow path.

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30. The device as claimed in claim 27, wherein the outlet openings are formed by a number of slots in the side wall of the tube.

31. The device as claimed in claim 27, wherein the outflow angle of the swirl element for the mixture amounts to 15°-85°.

32. The device as claimed in claim 31, wherein the outflow angle amounts to about 45°, about 60° or about 70°.

33. The device as claimed in claim 15, wherein the conical element is disposed at the end of the return conduit.

34. The device as claimed in claim 29, wherein the conical element is disposed at the end of the return conduit.

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EVIDENCE APPENDIX

None.

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RELATED PROCEEDINGS APPENDIX

None.